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COMMUNICATIONS CONTROLLER FOR COMMUNICATION WITH TELEPHONY OVER INTERNET PROTOCOL

CLAIM FOR PRIORITY

This application claims priority to International Application No. PCT/DE00/03115 which was published in the German language on September 7, 2000.

TECHNICAL FIELD OF THE INVENTION

The invention relates to a communications controller, and in particular, to a communications controller for calls arriving at a terminal device which operates in accordance with the telephony over Internet protocol, an identification of the calling subscriber or terminal being received along with the incoming calls.

BACKGROUND OF THE INVENTION

In the area of private branch exchanges, there is typically a central communications controller for establishing the procedure for handling calls coming to a terminal. This provides the "selective incoming-call protection" facility, which arranges for a diversion of calls coming from selected subscribers to another terminal or to a spoken-message and/or voice-recording system and puts through incoming calls from other subscribers. Publication DE 43 30 755 C2, in the case of central communication controllers, discloses incoming calls from selected subscribers to be put through to the terminal and all other incoming calls to be diverted to another terminal or to a spoken-message and/or voice-recording system.

In a PC, and consequently in a terminal for telephony over Internet protocol, there is conventionally a communication partner file, which contains a number of data records with data on communication partners of the subscriber to which the terminal is assigned. Each data record contains an entry for the name of the communication partner and one

or more communication addresses. If appropriate, such a data record may also contain additional information on the respective communication partner.

SUMMARY OF THE INVENTION

In one embodiment of the invention, there is a communications controller for communication operations which arrive at a terminal device for telephony over Internet protocol. The controller includes, for example, a device which compares a received identification of a calling subscriber with corresponding entries of a communication partner file of a called subscriber, the device provides a procedure to handle the incoming call in the communication partner file if the calling subscriber is recognized as a communication partner included in the communication partner file, and if the calling subscriber is not recognized as included in the communication partner file, the device provides a procedure to handle the incoming call.

In another aspect of the invention, the communications controller is located in the terminal device.

In another aspect of the invention, the communications controller is located in another device which is assigned to an IP network and which the terminal device for telephony over Internet protocol is configured for connection.

In another aspect of the invention, the device assigned to an IP network being a proxy module with a representative function for the terminal devices for telephony over Internet protocol which is configured for connection to the IP network.

In another embodiment of the invention, there is a method of controlling communication operations which arrive at a terminal device for telephony over Internet protocol. The method includes, for example, comparing a received identification of a calling subscriber with corresponding entries of a communication partner file

of a called subscriber, and providing a procedure to handle the incoming call in the communication partner file if the calling subscriber is recognized as a communication partner included in the communication partner file, and if the calling subscriber is not recognized as included in the communication partner file, providing a procedure to handle the incoming call.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is explained in more detail below on the basis of an exemplary embodiment with reference to the figures.

Figure 1 shows an exemplary embodiment of a flow diagram for realizing a selective call diversion as a proxy function in an H.323 network.

Figure 2 shows an exemplary embodiment of an H.323 proxy used in the method according to figure 1 in a schematic block representation of an extended protocol layer model (protocol stack).

Figure 3 shows a partial detail of a communications network in accordance with the standard ITU-T H.323 with endpoints, a gatekeeper function, a database and a proxy function in a schematic block representation.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention relates to a communications controller for calls arriving at a terminal device which operates in accordance with the telephony over Internet protocol, an identification of the calling subscriber or terminal being received along with the incoming calls. Calls directed to a terminal device for telephony over Internet protocol are usually put through to the called terminal device by an Internet protocol network, i.e. a data network operating on the basis of an Internet protocol, which operates for example in accordance with the standard ITU-T H.323. Provided in the called terminal device is a

communications controller, for which there is an established procedure for handling incoming calls. In the simplest case, incoming calls are always put through to be taken by a called subscriber. However, the subscriber may also provide that incoming calls are forwarded to another terminal or to a spoken-message and/or voice-recording device. The handling of incoming calls is in this case independent of the calling subscriber.

The present invention discloses an improved communications controller for communication operations which are directed to a terminal device for telephony over Internet protocol.

With each incoming call, a communications controller compares a received identification of the calling subscriber with the corresponding entries in a communication partner file of the called subscriber, and inquires about a procedure for handling incoming calls that is stored for the calling subscriber in the communication partner file. If the calling subscriber is stored as a communication partner in the communication partner file, and consequently there is a procedure for handling the incoming call stored in the communication partner file, the communications controller according to the invention arranges for this stored procedure for handling the incoming call to be implemented. If the calling subscriber is not recognized as included in the communication partner file, the communications controller arranges for a procedure for handling the incoming call that is provided for this case to be implemented.

In the communication partner file, there may be stored a detailed procedure for handling incoming calls for each communication partner, including a specified account of the exact procedure. Since, however, a communication partner file usually includes considerably more communication partner data records than different ways of handling incoming calls, it may also include for each storage communication partner a

pointer which points to a file which is assigned to this pointer and contains detailed particulars on how to handle incoming calls.

For terminal devices which can be connected in different network areas, for example for portable terminal devices, an advantageous embodiment comprises a communications controller in the terminal device. This ensures that the communication partner file and the communications controller are available independently of the network area in which the terminal device is connected. In the case of such an embodiment, the terminal device is in the switched-on operating state or put into the operating state when there is an incoming communication operation. If the terminal device is a computer, for example, it is consequently in the switched-on operating state if incoming communication operations are to be handled, or in a power-saving state which at least permits the detection of incoming calls and also allows the terminal device to be put into the active operating state when there is an incoming call.

Another embodiment of a communications controller is includes a device assigned to an Internet protocol network to which the terminal device for telephony over Internet protocol can be connected, the incoming communication operations of which are to be handled by the communications controller. In such a case, the handling of incoming calls for a terminal device is ensured even if the terminal device is switched off or is temporarily not been operated on the Internet protocol network.

Such a device assigned to an Internet protocol network may be realized, for example, in the area of a gatekeeper device of an Internet protocol network subarea. If appropriate, it is possible to use the same hardware device with which the gatekeeper function is also realized by using the corresponding software.

The device which is assigned to an Internet protocol network and within which the communications

controller can be realized may also be a proxy which represents a representative function for terminal devices for telephony over Internet protocol which can be connected to the said protocol network.

If a communications controller according to the invention is realized in a proxy with a representative function for terminal devices, a terminal device can, if it leaves the active operating state, for example is switched off, for example transmit to the gatekeeper responsible for the terminal device a message arranging for the gatekeeper to forward to the proxy calls arriving for the to the terminal device. In the situation mentioned it is also possible for the proxy to arrange for the gatekeeper to forward to the proxy calls arriving for the terminal device. For this purpose, the proxy may, for example, receive from the terminal device a message which indicates whether the terminal device is available for incoming calls. There is also the possibility that the proxy always checks after a certain period of time or at certain points in time the availability of terminal devices for incoming calls, in order that, if they are unavailable, the gatekeeper is informed that calls arriving for this terminal device are to be forwarded to the proxy.

It also favorable if, without requesting them, the proxy receives messages concerning changes in state with respect to the availability of terminals and if the proxy additionally checks from time to time the availability of the terminals. This makes it possible to ensure that, even if there is no message concerning a change in state, this change in state is registered after a certain time.

To allow the representation of figure 1 to be explained in a more intelligible way, firstly the H.323 proxy PROXI according to figure 2 and the H.323 communications network according to figure 3 are described.

Communication networks H.323 Net, as represented broadly in figure 3, are known in principle. The

communications network H.323 Net shown in figure 3 has a number of endpoints A, B, C, D and E, a gatekeeper function GK, a proxy function PROXI and a database DB. A proxy function PROXI, like a gatekeeper function GK, is a logical function within a communications network H.323 Net. A gatekeeper function GK is a logical function for performing standard functions such as address resolution and bandwidth management. Address resolution refers to a calling endpoint D sending to the gatekeeper an alias address of an endpoint E to be called and received from the gatekeeper GK the transport address, that is the Internet protocol address and the port number. The gatekeeper GK knows the volume of traffic with respect to real-time applications within the network area for which it is responsible. If a calling endpoint D sends to the gatekeeper GK a request for a connection with a certain bandwidth, the gatekeeper compares the requested bandwidth with the available bandwidth and, depending on the result of the comparison, sends a message to the calling endpoint A. The network shown in figure 3 differs from the known standard H.323 network by having a database DB for providing communication partner files and a special proxy function PROXI. An embodiment of such a proxy function PROXI is explained in more detail on the basis of an exemplary embodiment of a method according to the invention with reference to figure 1. The structure of such a proxy function PROXI is presented below on the basis of an extended protocol layer model with reference to figure 2.

In figure 2, an exemplary embodiment of an H.323 proxy PROXI is represented in a schematic block representation in the form of an extended protocol layer model.

As usual in networks conforming to ITU-T H.323, the communication of the H.323 proxy PROXI is based on the Internet protocol IP. On the basis of the Internet protocol IP, the protocol stack of the signaling that

is handling the call control is represented in the center of figure 2.

On the basis of the Internet protocol IP and the signaling protocol TCP, a function module H.225.0 conforming to the protocol ITU-T H.225.0 is provided here for the signaling of the basic call control in H.323 networks. Examples of messages of this function module H.225.0 are SETUP and CONNECT.

Also on the basis of the signaling protocol TCP, a function module H.245 conforming to the control protocol ITU-T H.245 is provided. One of the purposes of this function module H.245 is for exchanging TerminalCapability messages, that is for submitting and receiving information with respect to terminal capabilities. What is more, this function module H.245 serves for establishing task allocations, such as master and slave functions, and for opening and closing logical channels serving for user data transmission.

On top of the function module H.225.0 there are function modules of additional facility controllers, such as for example a function module H.450.1 for realizing a specific function and a function module H.450.3 for realizing a call diversion function of the standard ITU-T H.450.

In figure 2, a user data stack is represented to the left of the signaling stack just described. This user data stack is also based on the Internet protocol IP, on which there is UDP and on that, in turn, a real-time protocol RTP. In addition to the real-time protocol RTP, the protocol UDP also supports a real-time control protocol RTCP and that part H.225.0 RAS of the control protocol conforming to ITU-T H.225.0 which concerns the areas of registration, administration and status.

On the basis of the real-time protocol RTP, there are codecs or at least decoders for audio and video AUDIO, VIDEO. Such audio codecs AUDIO are designed for example to conform to one of the ITU-T standards G.711, G.723.1, G.728. Audio decoders AUDIO are also defined

by ISO MPEG4. ISO MPEG4 also defines corresponding video decoders VIDEO. When decoders conforming to ISO MPEG4 are used, proprietary coders are possibly contained in an H.323 proxy PROXI.

The real-time control protocol RTCP and the codecs or decoders for audio and video AUDIO, VIDEO are controlled by a media controller MEDIA CONTROL, which is responsible inter alia for the interaction of media input means INPUT-DEVICE, provided in the H.323 proxy PROXI, and a media output device that are optionally provided in an H.323 proxy PROXI and are therefore not represented. In this respect, the media input device INPUT-DEVICE are, for example (not shown explicitly in figure 2), cameras for video data, microphones for audio data or interfaces with data sources not included in the H.323 proxy PROXI. An output device (not shown explicitly in figure 2) could be, for example, a loudspeaker for audio data or interfaces with the output device not included in the H.323 proxy PROXI, such as printers or mass storage devices.

The described stack for user data handling RTP, RTCP, H.225.0, AUDIO, VIDEO and MEDIA CONTROL and the described stack for signaling handling H.245, H.225.0, CONFERENCE CONTROLLING, H.450.2, H.450.4 and H.450.5 are coupled to an application programming interface API via a coordination function COORDINATION FUNCTION. In this case, the coordination function COORDINATION FUNCTION coordinates the interaction of the units in this stack with the application programming interface API.

Examples of an application programming interface API are TAPI or CAPI. The application programming interface API switches between application programs applications and the coordination function COORDINATION FUNCTION.

In addition to the stacks required for multimedia communication, that is the described stacks for user data handling RTP, RTCP, H.225.0, AUDIO, VIDEO and MEDIA CONTROL and for signaling handling H.245,

H.225.0, H.450.1, H.450.3 and H.450..., another function module DB/DB Access is shown on the right-hand side in figure 2. This function module DB/DB Access is not based on the Internet protocol IP but is also coupled via the coordination function COORDINATION FUNCTION and the application programming interface API to applications APPLICATIONS. The function module DB/DB Access corresponds for example to an interface of the H.323 proxy PROXI with a database server (not shown), which includes communication partner files. The function module DB/DB Access may, however, also correspond to an interface with a database included in the H.323 proxy PROXI (not shown in figure 2) with communication partner files. If communication partner files are included in a database server, it goes without saying that this can also be accessed using signaling based on ITU-T H.450.

The structure of the function module DB/DB Access is not explicitly presented in figure 2, since corresponding industrial standard interfaces are sufficiently known. Such interfaces may be, for example, JDBC (JAVA Database Connectivity) or ODBC (Open Database Connectivity).

Figure 1 shows basic states, events and the message flow between three endpoints A, B and C of a communications network in accordance with the standard ITU-T H.323, a gatekeeper GK, a database DB and a proxy function which is provided in this communications network and is referred to hereafter as the H.323 proxy PROXI. The exemplary embodiment dealt with in figure 1 assumes that a subscriber to which the endpoint B is assigned wishes for a call diversion to the endpoint C for incoming calls from certain points, including endpoint A. In the present case, a terminal provided at the endpoint B is not ready for operation when a call arrives from the endpoint A:

In the initial state, the function H.323 proxy PROXI, the gatekeeper GK, the database DB and terminals (not shown) assigned to the endpoints A and C are

respectively in a rest state "idle". A terminal (not shown) assigned to the endpoint B is not in operation.

A subscriber at the endpoint A arranges via the gatekeeper GK for a connection to be set up to an endpoint B. For this purpose, the message SETUP, for example conforming to ITU-T H.225, is transmitted from the endpoint A to the gatekeeper GK, and would usually be forwarded by the gatekeeper GK to the endpoint B. In the present case, however, the gatekeeper GK receiving the SETUP message recognizes that the addressed destination endpoint B is not registered as available and that a representative address (proxy address) to an H.323 proxy PROXI has been set up for this endpoint in the event of unavailability.

The gatekeeper GK therefore addresses the SETUP message from the endpoint A to this H.323 proxy PROXI. The SETUP message includes the address of the originally called endpoint B.

The H.323 proxy PROXI receives the SETUP message and checks which procedure is to be used for handling calls for the endpoint B coming from the endpoint A. For this purpose, the H.323 proxy PROXI sends a request to the database DB.

As mentioned above, the database DB may either form a unit with the device realizing the proxy function PROXI or be spatially separate from it. A remote database DB can be accessed for example via interfaces conforming to JDBC (JAVA Database Connectivity) or ODBC (Open Database Connectivity), but also on the basis of an H.450 signaling. In the database it is checked within the communication partner file of the subscriber to which the endpoint B is assigned how calls arriving from the endpoint A are to be handled in the event of the terminal provided at the endpoint B not being ready for operation. It is possibly first checked for this purpose whether there is an entry with respect to the endpoint A in the

communication partner file of the subscriber to which the endpoint B is assigned.

The database DB transmits to the H.323 proxy PROXI the information found in this check: divert calls from endpoint A for endpoint B to endpoint C.

Then, the H.323 proxy PROXI arranges for a corresponding call diversion to be implemented, in the example represented a call diversion conforming to the ITU-T standard H.450.3. Using H.225.0, the H.323 proxy PROXI transmits for this purpose to the endpoint A a message FACILITY (H.450.3 callReroutingInvoke), invoking the call diversion facility.

This message includes the address of the call diversion destination. Although the terminal at the endpoint B is not in operation, this call diversion can be executed by the proxy function. The proxy function is provided for realizing this facility with respect to this terminal.

Consequently, the proxy function Proxi arranges for the facility message FACILITY (H.450 callReroutingInvoke) for the endpoint B that is not ready for operation. The endpoint A sends in a manner conforming to the ITU-T standard H.450.3 (for example February 1998 edition) and on the basis of H.225.0 a facility message FACILITY (H.450 callReroutingResult) directly to the H.323 proxy PROXI and then arranges, by a message H.225.0 ReleaseComplete to the H.323 proxy PROXI, for the signaling connection between H.323 proxy PROXI and the endpoint A to be released.

The endpoint A transmits to the endpoint C an H.245 TerminalCapabilitySet message with the data of the endpoint A. In a corresponding way, the endpoint C transmits to the endpoint A an H.245 TerminalCapabilitySet message with the data of the endpoint C. What is more, the position of the individual parties involved during the call between the endpoints A and C is established in a manner conforming to H.245 by the exchange of Master/SlaveDetermination

messages, whereupon a procedure for opening logical channels between the endpoints A and C is executed by means of messages conforming to ITU-T H.245.

Then logical channels are opened between the endpoints A and C, in order for example to transmit audio or video information. What is more, signaling connections exist between the endpoint A and the endpoint C.